

## **APPENDIX C**

### **REGULATIONS AND REQUIREMENTS ASSOCIATED WITH RADIATION SURVEYS AND SITE INVESTIGATIONS<sup>1</sup>**

#### **C.1 EPA Statutory Authorities**

The U.S. Environmental Protection Agency administers several statutes that address various aspects of the cleanup of radioactively contaminated sites. Listed below are the statutes, the implementing regulations, and the responsible EPA offices.

##### **C.1.1 The Office of Air and Radiation (OAR) administers several statutes and implementing regulations:**

- Clean Air Act (CAA) as amended (42 U.S.C. 7401-7671 q.): The CAA protects and enhances the nation's air quality through national ambient air quality standards, new source performance standards, and other provisions. Radionuclides are a hazardous air pollutant regulated under Section 112 of the Act.
  - National Emissions Standard for Hazardous Air Pollutants for Radionuclides (40 CFR Part 61, 10 CFR 20.101-20.108)
- Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (42 U.S.C. 2021-2022): UMTRCA requires stabilization and control of byproduct materials (primarily mill tailings) at licensed commercial uranium and thorium processing sites. NRC and DOE implement standards under this Act.
  - Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR Part 192)

This regulation, along with “Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material From Ores Processed Primarily for Their Source Material Content” (10 CFR 40, Appendix A), issued by the NRC and EPA, establish technical criteria related to the operation, decontamination, decommissioning, and reclamation of uranium or thorium mills and mill tailings. Both regulations provide design requirements for closure of the mill's waste disposal area.

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<sup>1</sup> The user of this manual should consult the text of the statutes and regulations listed in this Appendix to ensure compliance with all requirements applicable to a specific site and to ensure the use of current versions of applicable statutes and regulations.

The principal radiological hazards from uranium milling operations and mill tailings disposal are due to radon gas emissions originating from uranium and thorium daughters. Release rates to the atmosphere are limited to an average rate of 0.7 Bq (20 pCi) per square meter per second. This rate is applicable to any portion of a licensed or disposal site unless land areas do not contain radium concentrations—averaged over 100 square meters—greater than (i) 185 Bq/kg (5 pCi/g) of radium averaged over the first 15 centimeters below the surface and (ii) 555 Bq/kg (15 pCi/g) of radium averaged over 15 cm thick layers more than 15 centimeters below the surface.

- Atomic Energy Act (AEA) as amended (42 U.S.C. 2011-2296): The AEA requires the management, processing, and utilization of radioactive materials in a manner that protects public health and the environment. This is the principal basis for EPA, NRC and DOE authorities.

The AEA requires that source, special nuclear, and byproduct materials be managed, processed, and used in a manner that protects public health and the environment. Under the AEA and Reorganization Plan No. 3 of 1970, EPA is authorized to issue federal guidance on radiation protection matters as deemed necessary by the Agency or as mandated by Congress. This guidance may be issued as regulations, given that EPA possesses the authority to promulgate generally applicable radiation protection standards under Reorganization Plan No. 3. For example, under AEA authority EPA promulgated its environmental radiation protection standards for nuclear power operations in 40 CFR Part 190.

In conjunction with the AEA, EPA presently supports the following:

- Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear, High-Level and Transuranic Radioactive Wastes (40 CFR 191)
- Nuclear Waste Policy Act (NWPA), as amended (Pub. L. 100-507, 42 U.S.C. 10101): The NWPA is intended to provide an orderly scheme for the selection and development of repositories for high-level radioactive waste and spent nuclear fuel.
- Low Level Radioactive Waste Policy Act (LLRWPA), as amended (Pub. L. 99-240, 42 U.S.C. 2021b): LLRWPA assigns States responsibility for ensuring adequate disposal capacity for low-level radioactive waste generated within their borders.
- Indoor Radon Abatement Act of 1988 (15 U.S.C. 2601 Sec. 301-311)

**C.1.2 The Office of Emergency and Remedial Response (OERR) administers the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended (Pub. L. 99-499, 42 U.S.C. 9601-9657)**

- CERCLA authorizes EPA, consistent with the National Oil and Hazardous Substances Contingency Plan (NCP, 40 CFR 300) to provide for remedial action in response to releases or substantial threats of releases of hazardous substances into the environment. Hazardous substances are defined as any substance designated or listed under the Clean Air Act, the Federal Water Pollution Control Act, the Toxic Substances Control Act, and the Resource Conservation and Recovery Act. Because the CAA designated radionuclides as a hazardous air pollutant, the provisions of CERCLA apply to radionuclides.

**C.1.3 The Office of Solid Waste (OSW) administers the Resource Conservation and Recovery Act of 1976 (RCRA), as amended (Pub. L. 94-580, 42 U.S.C. 6901 *et seq.*)**

- RCRA provides for detailed regulation of hazardous waste from generation to final disposal. Hazardous waste generators and transporters must comply with EPA standards. Owners and operators of treatment, storage, or disposal facilities must obtain RCRA permits. Materials defined in the AEA are expressly excluded from the definition of solid waste, and, thus from regulation under RCRA. Naturally occurring and accelerator produced radioactive materials, however, are not excluded.

**C.1.4 The Office of Water (OW) administers several statutes and implementing regulations:**

- Section 14.2 of the Public Health Service Act as amended by the Safe Drinking Water Act (SDWA) as amended (Pub. L. 93-523, 42 U.S.C. 300f *et seq.*). As amended in 1986, SDWA seeks to protect public water supply systems through protection of groundwater. Any radioactive substance that may be found in water is regulated under the Act (although the current regulations only specify a limited number of individual substances).
  - Maximum Contaminant Levels (includes certain radionuclides). (40 CFR 141.11-141.16)
- Clean Water Act as amended (Pub. L. 92-500, 33 U.S.C. 1251 *et seq.*)
  - Requirements (40 CFR Parts 131, 400-469) established pursuant to sections 301, 302, 303 (including State water quality standards), 306, 307, (including Federal Pretreatment requirements for discharge into a publicly owned treatment works), and 403 of the Clean Water Act.

### **C.1.5 The Office of Prevention, Pesticides and Toxic Substances administers the Toxic Substances and Control Act (TSCA; 15 U.S.C. 2601)**

- TSCA regulates the manufacture, distribution in commerce, processing, use, and disposal of chemical substances and mixtures. Materials defined in the AEA are expressly excluded from TSCA. However, naturally occurring and accelerator produced radionuclides are not excluded.

## **C.2 DOE Regulations and Requirements**

### **C.2.1 Authorities of the Department of Energy**

The Department of Energy Organization Act, which created DOE, the Energy Reorganization Act of 1974, which created the Energy Research and Development Administration, and the Atomic Energy Act of 1954<sup>2</sup> provide the basic authorities of the Department of Energy. The principal DOE statutory authorities and regulations that pertain to radiation protection are shown in Table C.1.

#### **C.2.1.1 Atomic Energy Act of 1954, as amended**

The Atomic Energy Act of 1954 established a program of private ownership and use of nuclear materials and nuclear facilities, such as nuclear research reactors, and a program for government regulation of those applications. (Prior to 1954, all source, byproduct, and special nuclear materials were government owned). The Atomic Energy Commission was given both the regulatory authorities and the mission to develop both the peaceful and military uses of atomic energy. The Act also retained the Atomic Energy Commission as the civilian agency responsible for weapons programs production, development and research consistent with the Atomic Energy Act of 1946.

Under the Act, the Atomic Energy Commission was responsible for establishing regulations ensuring the safety of commercial facilities and establishing requirements that ensure public protection from radiation and radioactive materials resulting from or used in its research, development, and production activities.

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<sup>2</sup>The Atomic Energy Commission was created by the Atomic Energy Act of 1946, not the 1954 act.

Table C.1

## DOE AUTHORITIES, ORDERS AND REGULATIONS RELATED TO RADIATION PROTECTION

### Statutes

Atomic Energy Act of 1954, as amended

Energy Reorganization Act of 1974

Uranium Mill Tailings Radiation Control Act of 1978, as amended

Nuclear Non-Proliferation Act of 1978

Department of Energy Organization Act of 1980

West Valley Demonstration Project Act of 1980

Nuclear Waste Policy Act of 1982

Low-Level Waste Policy Act of 1980

Low-Level Waste Policy Amendments Act of 1985

Energy Policy Act of 1992

Waste Isolation Pilot Plant Land Withdrawal Act

Price Anderson Act

Order 5400.1, "General Environmental Protection Program"

Order 5400.2A, "Environmental Compliance Issue Coordination"

Order DOE 5400.5, "Radiation Protection of the Public and the Environment"

Order DOE 5400.4, "Comprehensive Environmental, Response, Compensation and Liability Act Requirements"

Order DOE 5440.1E, "National Environmental Policy Act Compliance Program"

Order DOE 5480.1B, "Environment, Safety and Health Program for Department of Energy Facilities"

Order DOE 5480.3, "Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances & Hazardous Wastes"

Order DOE 5480.4, "Environment, Safety and Health Protection Standards"

Order DOE 5480.6, "Safety of Department of Energy Owned Nuclear Reactors"

Order DOE 5480.11, "Occupational Radiation Protection"

Order DOE 5480.24, "Nuclear Criticality Safety"

Order DOE 5480.25, "Safety at Accelerator Facilities"

Order DOE 5484.1, "Environmental Protection, Safety and Health Protection Information Reporting Requirements"

Order DOE 5820.2A, "Radioactive Waste Management"

### DOE Regulations

10 CFR Part 835, "Occupational Radiation Protection"

### Executive Orders

Executive Order 12580

### DOE Orders

#### C.2.1.2 Energy Reorganization Act of 1974 (Public Law 93-438 (1974), as amended)

The Energy Reorganization Act of 1974 divided the former Atomic Energy Commission and created the Energy Research and Development Administration (ERDA) and the Nuclear Regulatory Commission. The ERDA was responsible for radiation protection at its facilities, to provide for worker and public health, worker safety, and environmental protection. ERDA was abolished with the creation of the Department of Energy in 1980.

#### C.2.1.3 Department of Energy Organization Act of 1977 Public Law 95-91

The Department of Energy Organization Act created the Department of Energy (DOE) by combining the Energy Research & Development Administration, the Federal Energy Administration, Federal Power Commission, and part of the Department of Interior.

The DOE was intended to identify potential environmental, health, safety, socioeconomic, institutional, and technological issues associated with the development and use of energy sources. Through this Act, DOE retained the responsibilities and authorities—held by its predecessor agencies—to take actions necessary to protect the public from radiation associated with radioactive materials production, research, and development. DOE established requirements through a directives system that largely used DOE Orders as its regulatory procedures. With the passage of the Price-Anderson Act Amendments of 1990, DOE began converting its health and safety Orders to rules.

#### C.2.1.4 Uranium Mill Tailings Radiation Control Act of 1978, as amended

The Uranium Mill Tailings Radiation Control Act (UMTRCA) provides a program of assessment and remedial action at active and inactive uranium mill sites to control their tailings in a safe and environmentally sound manner and to reduce radiation hazards to the public residing in the vicinity of these sites. The DOE was directed to complete remedial action at 21 sites of inactive uranium mills.

#### C.2.1.5 West Valley Demonstration Project Act of 1980

This act authorized DOE to carry out a project at West Valley, New York to demonstrate solidification techniques which could be used for preparing high level radioactive waste for disposal. The Act provides for informal review and project consultation by the NRC.

#### C.2.1.6 Low-Level Waste Policy Act of 1980

This act established the policy that each State is responsible for providing for the disposal of low-level radioactive waste generated within its borders, except for waste from defense activities of

DOE or Federal research and development activities, and authorized States to enter into compacts to carry out this policy. DOE was required to take actions to assist the States in carrying out this policy.

#### C.2.1.7 Nuclear Waste Policy Act of 1982 (Public Law 97-425, 1983)

This Act gives DOE the responsibility to develop repositories and to establish a program of research, development, and demonstration for the disposal of high-level radioactive waste and spent nuclear fuel. Title to and custody of commercial low-level waste sites under certain conditions could be transferred to DOE.

#### C.2.1.8 Low-Level Waste Policy Amendments Act of 1985

This act amends the Low-Level Waste Policy Act of 1980 to improve the procedures for State compacts. It also assigns responsibility to the Federal government for the disposal of low-level waste generated or owned by the DOE, specific other Federally generated or owned wastes, and wastes with concentrations of radionuclides that exceed the limits established by the NRC for class C radioactive waste. The Act provides that all class C radioactive wastes designated as a Federal responsibility—those that result from activities licensed by the NRC—shall be disposed of in a facility licensed by the NRC. The Act also assigns responsibilities to DOE to provide financial and technical assistance to the States in carrying out the Act.

#### C.2.1.9 Waste Isolation Pilot Plant Land Withdrawal Act

The Waste Isolation Pilot Plant (WIPP) is a repository intended for the disposal of transuranic radioactive waste produced by defense activities. The Act establishes the following:

- 1) an isolated parcel of land for the WIPP
- 2) provisions concerning testing and limits on the quantities of waste which may be disposed at the WIPP
- 3) EPA certification of compliance with disposal standards

#### C.2.1.10 Price Anderson Act

### **C.2.2 Executive Orders**

Executive Order (E.O.) 12580 delegates to various Federal officials the responsibilities vested in the President for implementing the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

### **C.2.3 DOE Regulations and Orders**

#### **C.2.3.1 10 CFR Part 835, "Occupational Radiation Protection"**

This rule, which became effective on January 13, 1993, provides for the protection of radiation workers at DOE owned facilities. The requirements contained in Part 835 are generally similar to those in Order DOE 5480.11 and those used in NRC Regulations pertaining to the commercial nuclear industry. In addition to the rule, DOE issued a dozen implementation guides, including the "DOE Radiological Control Manual," (DOE/EH-0256T, Rv.1, April 1994).

#### **C.2.3.2 Order DOE 5400.5, "Radiation Protection of the Public and the Environment"**

This Order, issued in February 1990, contains DOE's requirements for ensuring the protection of the public from the hazards of radiation. This regulation includes dose limits for protection of the public and environment, plus requirements:

- 1) to apply the ALARA process—to reduce doses to the public as far below the release criterion as is practicable
- 2) to apply the best available control technology to liquid effluents
- 3) for control of property containing residual radioactive material

DOE 5400.5 is supported by numerous guidance documents, including those listed in this section.

DOE 5400.5 is the primary directive relating to the release of property subject to radiological contamination by DOE operations. DOE 5400.5 will be replaced by 10 CFR Part 834 and its guidance will be adopted for Part 834 when it is issued.

Under DOE 5400.5 and the guidance included in this section (C.2.3), DOE established requirements for a case-by-case review and approval for release of real or non-real property containing residual radioactive material. Authorized limits and measurement procedures must be developed by DOE before facilities can release property from their control. The principle requirement is to reduce doses to levels that are as low as practicable using the ALARA process and assuming realistic but conservative use scenarios that are not likely to underestimate dose. This requirement ensures that doses are as far below the primary dose limit (1 mSv/y [100 mrem/y]) as is reasonably achievable. Because the primary dose limit is for doses from all sources and pathways, authorized limits should be selected at levels below a DOE dose constraint of 0.3 mSv/y (30 mrem/y). However, the goal is to reduce doses under likely-use scenarios to a few fractions of a mSv/year or less.



In addition to the requirement to apply ALARA and the dose constraint, DOE also utilizes surface contamination guidelines similar to those in NRC Regulatory Guide 1.86 and the 40 CFR Part 192 soil concentration limits for radium and thorium. The ALARA requirement ensures that the 40 CFR Part 192 limits are appropriately used. DOE also permits the use of supplemental limits for situations where cleanups to authorized limits are not practicable or where the scenarios used to develop the authorized limits are not appropriate. DOE 5400.5 permits the release of property for restricted use and requires procedures to ensure these restrictions are maintained.

Most DOE remedial action and restoration activities are also subject to CERCLA. In such cases, DOE requirements are integrated into the CERCLA process.

The following sections describe the scope and importance of several guidance documents.

#### A. Residual Radioactive Material Control:

DOE/CH-8901, Manual for Implementing Residual Radioactive Material Guidelines - A Supplement to the U.S. Department of Energy Guidelines for Residual Radioactive Material at FUSRAP and SFMP Sites, Department of Energy, June 1989.

DOE Guidance Memorandum, "Unrestricted Release of Radioactively Contaminated Personal Property," J. Maher, DOE Office of Nuclear Safety, Mar. 15, 1984.

ANL/EAD/LD-2, Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0, Published by Argonne National Laboratory and prepared by ANL and DOE staff, September 1993.

ANL/EAIS-8, Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil, Argonne National Laboratory, April 1993.

ANL/EAIS/TM-103, A Compilation of Radionuclide Transfer Factors for Plant, Meat, Milk and Aquatic Food Pathways and Suggested Default Values for the RESRAD Code, Argonne National Laboratory, August 1993.

PNL-8724, Radiation Dose Assessments to Support Evaluations of Radiological Control Levels for Recycling or Reuse of Material and Equipment, Pacific Northwest Laboratory, July 1995.

ANL/EAD.LD-3, RESRAD-Build: A Computer Model for Analyzing the Radiological Doses Resulting from the Remediation and Occupancy of Buildings Contaminated with Radioactive Material, Argonne National Laboratory, November 1994.

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### B. ALARA

DOE Guidance: DOE Guidance on the Procedures in Applying the ALARA Process for Compliance with DOE 5400.5, Department of Energy, Office of Environmental Guidance, March 8, 1991.

ANL/EAD/LD-2, Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Version 5.0, Chapters 1 and 5 and App. M, September 1993.

### C. Measurement and Data Reporting

DOE Manual for use and Comment, Environmental Implementation Guide for Radiological Survey Procedures, Department of Energy, Office of Environmental Guidance, Nov. 1992.

DOE/EH-0173T, Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance, Department of Energy, Jan. 1991.

### D. Dose Factors

DOE/EH-0071, Internal Dose Conversion Factors for Calculation of Dose to the public, DOE, July 1988. DOE currently recommends use of EPA-520-1-88-020, Federal Guidance Report No. 11, Limiting Radionuclide Intake and Air Concentrations and Dose Conversion Factors for Inhalation, Submersion and Ingestion, Environmental Protection Agency, Sept. 1988, as an alternative to DOE/EH-0071.

DOE/EH-0070, External Dose-Rate Conversion Factors for Calculation of Dose to the Public, DOE, July 1988. DOE currently recommends use of EPA 402-R-93-081, Federal Guidance Report No. 12, External Exposure to Radionuclides in Air, Water and Soil, Environmental Protection Agency, Sept. 1993, as an alternative to DOE/EH-0070.

### E. Liquid Effluents

Implementation Guidance for DOE 5400.5, Section II.3 (Management and Control of Radioactive Materials in Liquid Discharges and the Phaseout of Soil Columns), DOE Office of Environment, June 1992.

#### C.2.3.3 Order DOE 5820.2A, "Radioactive Waste Management"

Order DOE 5820.2A establishes the policies, guidelines, and requirements by which the DOE manages its radioactive and mixed waste and contaminated facilities. The Order implements DOE's responsibilities and authorities for protection of public and worker health and safety and

the environment under the Atomic Energy Act. It contains the requirements for management and disposal of high-level waste, transuranic waste, low-level waste, NARM waste, and for the decommissioning of radioactively contaminated facilities.

#### A. High-level Waste

The Order specifies: (1) requirements for storage operations including requirements for waste characterization, transfer operations, monitoring, surveillance, and leak detection, and (2) specifies that disposal shall be in accordance with the requirements of the Nuclear Waste Policy Act of 1982.

#### B. Transuranic Waste

The Order requires waste to be certified in compliance with the Waste Isolation Pilot Plant-Waste Acceptance Criteria and sent to the WIPP. There are requirements for waste classification, waste generation and treatment, waste certification, waste packaging, temporary storage, transportation and shipping, and interim storage. There are provisions for use of the WIPP, and for assessing the disposition of previously buried transuranic-contaminated wastes.

#### C. Low-level Waste

The Order specifies performance objectives which assure that external exposure waste concentrations of radioactive material—which may be released into surface water, ground water, soil, plants, and animals—result in an effective dose equivalent that does not exceed 0.25 mSv/y (25 mrem/y) to a member of the public. Releases to the atmosphere shall meet the requirements of 40 CFR Part 61. Reasonable efforts should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable. Radiological performance assessments are required for the disposal of waste for the purpose of demonstrating compliance with these performance objectives.

For low-level waste, there are also requirements on waste generation, waste characterization, waste acceptance criteria, waste treatment, and long term storage. The Order includes additional disposal requirements concerning disposal facility and disposal site design and waste characteristic, site selection, facility operations, site closure and post closure, and environmental monitoring.

#### D. NARM Waste

For management of Naturally-Occurring and Accelerator-Produced Radioactive Materials (NARM) and 11(e)(2) byproduct materials (the tailings or wastes resulting from the concentration of uranium or thorium), the order specifies that storage and disposal shall be

consistent with the requirements of the residual radioactive material guidelines contained in 40 CFR 192.

#### E. Decommissioning of Radioactively Contaminated Facilities

For the decommissioning of contaminated facilities, the order requires DOE organizations to develop and document decommissioning programs which include provisions for surveillance and maintenance. There are requirements for facility design, post-operational activities, characterization, and environmental review.

### C.3 NRC Regulations and Requirements

#### C.3.1 NRC's Mission and Statutory Authority

The mission of the U.S. Nuclear Regulatory Commission (NRC) is to ensure adequate protection of the public health and safety, the common defense and security, and the environment in the use of nuclear materials in the United States. The NRC's scope of responsibility includes regulation of commercial nuclear power reactors; nonpower research, test, and training reactors; fuel cycle facilities; medical, academic, and industrial uses of nuclear materials; and the storage and disposal of nuclear materials and waste.

The NRC is an independent agency created by the Energy Reorganization Act of 1974. This Act abolished the Atomic Energy Commission (AEC), moved the AEC's regulatory function to NRC, and, along with the Atomic Energy Act of 1954, as amended, provides the foundation for regulation of the nation's commercial nuclear power industry.

NRC regulations are issued under the United States Code of Federal Regulations (CFR) Title 10, Chapter 1. Principal statutory authorities that govern NRC's work are:

- Atomic Energy Act of 1954, as amended
- Energy Reorganization Act of 1974, as amended
- Uranium Mill Tailings Radiation Control Act of 1978, as amended
- Nuclear Non-Proliferation Act of 1978
- Low-Level Radioactive Waste Policy Act of 1980
- West Valley Demonstration Project Act of 1980
- Nuclear Waste Policy Act of 1982
- Low-Level Radioactive Waste Policy Amendments Act of 1985
- Diplomatic Security and Anti-Terrorism Act of 1986
- Nuclear Waste Policy Amendments Act of 1987
- Solar, Wind, Waste and Geothermal Power Production Incentives Act of 1990
- Energy Policy Act of 1992

The Atomic Energy Act of 1954, as amended, allows the NRC to issue orders to both licensees and persons not licensed by the NRC. NRC orders may be a means of compelling decommissioning at sites where the license has been terminated or at sites that were not previously licensed but currently contain radioactive material that is under the jurisdiction of the NRC.

The NRC and its licensees share a common responsibility to protect the public health and safety. Federal regulations and the NRC regulatory program are important elements in the protection of the public. NRC licensees, however, have the primary responsibility for the safe use of nuclear materials.

### **C.3.2 NRC Criteria for Decommissioning**

This section of the survey manual contains information on the existing cleanup criteria for decommissioning sites regulated by the NRC. Additional cleanup criteria established by State and local governments may also be applicable at NRC-licensed sites at the time of decommissioning.

NRC's requirements for decommissioning and license termination are contained in 10 CFR 30.36, 40.42, 50.82, 70.38, and 72.54. The radiological criteria for license termination are contained in 10 CFR 20.1401 through 1406 (62 FR 39058, July 21, 1997).

Prior to the adoption of the current regulations on radiological criteria for license termination, the Commission's position on residual contamination criteria, site characterization, and other related decommissioning issues was outlined in a NRC document entitled "Action Plan to Ensure Timely Cleanup of Site Decommissioning Management Plan Sites," which was published in the Federal Register on April 6, 1993 (57 FR 13389). Other documents that were used in the past and which may continue to have some applicability in special cases include:

"Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material From Ores Processed Primarily for Their Source Material Content" (10 CFR 40, Appendix A) and Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192, Subparts D and E)

These regulations, issued by the NRC and EPA, establish technical criteria related to the operation, decontamination, decommissioning, and reclamation of uranium or thorium mills and mill tailings. Both regulations provide design requirements for closure of the mill's waste disposal area, which requires an earthen cover over tailings or waste piles to control radiological hazards from uranium and thorium tailings for 200 to 1,000 years, according to Technical Criterion 6 of Appendix A to 10 CFR Part 40.

The principal radiological hazards from uranium milling operations and mill tailings disposal are radon from uranium and thorium daughters. The atmospheric release rates of these gaseous radionuclides to the atmosphere are limited to an average rate of 0.7 Bq (20 pCi) per square meter per second. This rate is applicable to any portion of a licensed or disposal site unless land areas do not contain radium concentrations—averaged over 100 square meters—greater than: (i) 0.2 Bq/g (5 pCi/g) of radium averaged over the first 15 centimeters below the surface, and (ii) 0.6 Bq/g (15 pCi/g) of radium averaged over 15-centimeter thick layers more than 15 centimeters below the surface.

Criterion 6 allows radon release rates to be averaged over a period of at least 1 year (but much less than 100 years) to account for the wide variability in atmospheric radon concentrations over short time periods and seasons. In addition, this criterion applies only to emissions from uranium daughters and does not include radon emissions from earthen materials used to cover the tailings piles. If appropriate, radon emissions from cover materials are evaluated when developing a closure plan for each site to account for this additional contribution from naturally occurring radon. However, direct gamma exposure rates from tailings or wastes should be reduced to background levels according to this standard.

### **C.3.3 NRC Decommissioning Process and Staff Plans for Implementing Survey Procedures in this Manual**

NRC licensees are required to conduct radiation surveys of the premises where the licensed activities were conducted and submit a report describing the survey results. The survey process follows requirements contained in 10 CFR 30.36, 40.42, 50.82, 70.38, and 72.54, which pertain to decommissioning of a site and termination of a license. This process leads to the unrestricted release of a site; however, many of the requirements may not be necessary if the licensee demonstrates that the premises are suitable for release in some other manner. Each year, the NRC staff routinely evaluates licensee requests to discontinue licensed operations. The majority of these requests are straightforward, requiring little, if any, site remediation before radiological surveys are conducted and evaluated. However, some NRC sites require substantial remediation because buildings and lands contain nonroutine amounts of radiological contamination. Radiological surveys may also be performed by the NRC at sites where there is not a license.

The NRC decommissioning process for a site requiring substantial remediation can be described by the activities listed below:

- licensee notifies the NRC they intend to decommission all or part of the site
- site characterization, including preparation of the characterization plan and performance of site characterization
- development and submission of decommissioning plan

- NRC review and approval of decommissioning plan
- performance of decommissioning actions described in the plan
- performance of termination survey and submittal of termination survey report
- NRC performance and documentation of confirmatory survey
- NRC termination of license

The NRC staff plans to use the information contained in this manual as primary guidance for conducting radiological surveys of routine licensee requests for license termination and nonroutine license termination requests that require more extensive decommissioning actions. Supplementary guidance may be used by the NRC staff to assist licensees in conducting such surveys or aid the NRC staff in evaluating licensee's survey plans and survey results to determine compliance with decommissioning criteria. Examples of supplementary guidance include NRC Information Notices, Bulletins, Generic Letters, Branch Technical Positions, NUREG reports, Regulatory Guides, and other regulatory documents that transmit NRC requirements and guidance.

## **C.4 DOD Regulations and Requirements**

The Department of Defense (DOD) consists of four primary military services: the United States Air Force, the United States Army, the United States Navy, and the United States Marine Corps.

DOD installations use sources of ionizing radiation and support radiation protection programs for the control of these radioactive materials. As a Federal agency, the DOD complies with all applicable environmental regulations under the Federal Facilities Compliance Act of 1992.

### **C.4.1 DOD Sources of Ionizing Radiation**

DOD's list of radioactive materials includes:

- Special nuclear material such as plutonium or enriched uranium
- Source material such as uranium or thorium
- Byproduct material such as any radioactive material yielded in or made radioactive by exposure to radiation incident to the process of producing special nuclear material
- Naturally occurring or accelerator-produced radioactive material (NARM), such as radium, and not classified as source material
- Materials containing induced or deposited radioactivity

**Ionizing Radiation Producing Devices:** Electronic devices that are capable of emitting ionizing radiation. Examples are linear accelerators, cyclotrons, radiofrequency generators that use klystrons or magnetrons, and other electron tubes that produce x-rays. These devices may have

components that contain radioactive material or they may induce radioactivity in certain other materials.

#### **C.4.2 Commodities Containing Radioactive Material Within the DOD System**

The DOD uses a variety of manufactured items (commodities) incorporating in whole or in part both sealed and unsealed radioactive material. A sealed source is any radioactive material that is permanently bound or fixed in a capsule or matrix designed to prevent the release or dispersal of such material under the most severe conditions encountered in normal use.

Ionizing radiation is used directly in DOD systems as calibration and check sources for RADIAC or other survey-type instruments, as a source of radioluminescence in meters and gauges, as an ionization source in various devices, and as radiographic sources.

Indirectly, ionizing radiation may be emitted from a DOD material system as natural radioactivity or induced radioactivity incorporated into material or a component of the system.

Specific examples of commodities include instrument calibration sources, luminescent compasses and exit signs, certain electron tubes and spark gaps, depleted uranium counterweights and munitions, and magnesium-thorium aircraft components.

#### **C.4.3 Licensed Radioactive Material**

Licensed radioactive material is source, special nuclear, or byproduct material received, stored, possessed, used, or transferred under a specific or general license issued by the NRC or an NRC Agreement State.

Radioactive material licensed or controlled by the individual military services:

- The Department of the Air Force has been designated by the NRC, through the issuance of a Master Materials License, regulatory authority for the receipt, possession, distribution, use, transportation, transfer, and disposal of radioactive material at Air Force activities. The Air Force Radioisotope Committee was established to provide administrative control of all radioactive material used in the Air Force except for reactors and associated radioactivity, nuclear weapons, and certain components of weapons delivery systems. Air Force Radioactive Material Permits are used to maintain this control.
- The Department of the Army, through the issuance of NRC specific licenses to Army installations and activity commanders, maintains the regulatory authority for the receipt, possession, distribution, use, transportation, transfer, and disposal of radioactive material



at Army activities. In addition, within the Department of the Army, radioactive material classified as NARM may be used under a Department of the Army Radioactive Material Authorization (DARA) issued by the Army Material Command (AMC) or the Office of The Army Surgeon General. A Department of the Army Radiation Permit is required for use, storage, possession, and disposal of radiation sources by non-Army agencies (including contractors) on Army installations.

- The Department of the Navy is designated by the NRC to have—through the issuance of a Master Materials License—regulatory authority for the receipt, possession, distribution, use, transportation, transfer, and disposal of radioactive material at Navy and Marine Corps activities. The Navy Radiation Safety Committee was established to provide administrative control of all radioactive material used in the Navy and Marine Corps except for nuclear propulsion reactors and associated radioactivity, nuclear weapons, and certain components of weapons delivery systems. Navy Radioactive Material Permits are used to maintain this control.

#### **C.4.4 Other Controlled Radioactive Material**

Certain radioactive material on DOD installations may not be controlled or regulated by either the NRC or the DOE. However, during Base Realignment and Closure actions, DOD installation property which is identified to be returned to civilian use may have the potential for radioactive contamination by such material. The DOD complies with applicable State limits, guidelines, and procedures for this material. The methodologies and technical approaches for environmental radiological surveys outlined in this manual will provide guidance for dealing with issues concerning this material.

##### **Naturally Occurring and Accelerator-Produced Radioactive Material**

- Naturally occurring and accelerator-produced radioactive material (NARM) is controlled and regulated by the individual military services, as is similarly done by certain States for corporations and other users residing within their boundaries.

##### **Special Nuclear Material Used in Military Applications**

- Special nuclear material used in military applications is a unique category of radioactive material. This may be buried as radioactive waste on DOD installations, used in military weapons or utilization facilities, or used in nuclear reactors involving military applications on DOD installations. Radioactive material used or associated with weapons systems or reactors associated with such military applications is exempt from NRC and State regulations under Section 91b, Chapter 9, Military Application of Atomic Energy, Atomic Energy Act of 1954.

#### **C.4.5 DOD Regulations Concerning Radiation and the Environment**

The DOD, with its global mission, supports several directives and instructions concerning environmental compliance. The individual military services have regulations implementing these directives and instructions. The documents describing these regulations are used as guidance in developing environmental radiological surveys within DOD.

The DOD and each military service also have specific regulations addressing the use of radioactive sources and the development of occupational health programs and radiation protection programs. These regulations may help in identifying potential locations and sources of radioactive contamination on DOD installations.

#### **C.4.6 DOD Regulations and Requirements**

##### **Regulations and Requirements Concerning Development of Environmental Radiological Surveys**

1. DOD Directive 4165.60, Solid and Hazardous Waste Management-Collection, Disposal, Resource Recovery, and Recycling Program.
2. DOD Directive 4210.15, Hazardous Material Pollution Prevention.
3. DOD Directive 5100.50, Protection and Enhancement of Environmental Quality.
4. DOD Directive 6050.1, Environmental Effects in the United States of Department of Defense Actions.
5. DOD Directive 6050.7, Environmental Effects Abroad of Major Department of Defense Actions.
6. DOD Directive 6050.8, Storage and Disposal of Non-DOD-Owned-Hazardous or Toxic Materials on DOD Installations.
7. DOD Instruction 4120.14, Environmental Pollution Prevention, Control, and Abatement.
8. DOD Instruction 5100.5, Protection and Enhancement of Environmental Quality.

##### **Regulations and Requirements Concerning Use of Radioactive Sources and Development of Occupational Health Programs and Radiation Protection Programs:**

1. DOD Instruction 6055.5-M, Occupational Health Surveillance Manual.
2. DOD Instruction 6055.8, Occupational Radiation Protection Program.

##### **Examples of Air Force Instructions (AFIs):**

1. AFI 40-201, Managing Radioactive Materials in the Air Force.
2. AFI 32-7020, Environmental Restoration Program.
3. AFI 32-7066, Environmental Baseline and Close-out Surveys in Real Estate Transactions.

Examples of Army Regulations (ARs):

1. AR 40-5, Preventive Medicine.
2. AR 40-14, Occupational Ionizing Radiation Personnel Dosimetry.
3. AR 40-10, Health Hazard Assessment Program in Support of the Army Materiel Acquisition Decision Process.
4. AR 200-1, Environmental Protection and Enhancement.
5. AR 200-2, Environmental Effects of Army Actions.
6. AR 385-11, Ionizing Radiation Protection (Licensing, Control, Transportation, Disposal, and Radiation Safety).
7. AR 385-30, Safety Color Code Markings and Signs.
8. AR 700-64, Radioactive Commodities in the DOD Supply System.
9. AR 750-25, Army Test, Measurement, and Diagnostic Equipment (TMDE) Calibration and Repair Support Program.
10. TB MED 521, Management and Control of Diagnostic X-Ray, Therapeutic X-Ray, and Gamma Beam Equipment.
11. TB MED 522, Control of Health Hazards from Protective Material Used in Self-Luminous Devices.
12. TB MED 525, Control of Hazards to Health from Ionizing Radiation Used by the Army Medical Department.
13. TB 43-180, Calibration and Repair Requirements for the Maintenance of Army Materiel.
14. TB 43-0108, Handling, Storage, and Disposal of Army Aircraft Components Containing Radioactive Material.
15. TB 43-0116, Identification of Radioactive Items in the Army.
16. TB 43-0122, Identification of U.S. Army Communications-Electronic Command Managed Radioactive items in the Army.
17. TB 43-0141, Safe Handling, Maintenance, Storage, and Disposal of Radioactive Commodities Managed by U.S. Army Troop Support and Aviation Material Readiness Command (Including Aircraft Components).
18. TB 43-0197, Instructions for Safe Handling, Maintenance, Storage, and Disposal of Radioactive Items Managed by U.S. Army Armament Material Command.
19. TB 43-0216, Safety and Hazard Warnings for Operation and Maintenance of TACOM Equipment.
20. TM 3-261, Handling and Disposal of Unwanted Radioactive Material.
21. TM 55-315, Transportability Guidance for Safe Transport of Radioactive Materials.

Examples of Navy Regulations:

1. NAVMED P-5055, Radiation Health Protection Manual.
2. NAVSEA SO420-AA-RAD-010, Radiological Affairs Support Program (RASP) Manual.
3. OPNAV 6470.3, Navy Radiation Safety Committee.

4. NAVSEA 5100.18A, Radiological Affairs Support Program.
5. OPNAV 5100.8G, Navy Safety and Occupational Safety and Health Program.
6. NAVMEDCOM 6470.10, Initial Management of Irradiated or Radioactively Contaminated Personnel.
7. OPNAV 3710.31, Carrying Hazardous Materials; Operational Procedures.
8. NAVSUP 5101.11, Procedures for the Receipt, Storage, and Handling of Radioactive Material Shipments.
9. NAVSUP 5101.6, Procedures for the Requisitioning, Labeling, Handling, Storage, & Disposal of Items Which Contain Radioactive By-Product Material.
10. NAVSUP 4000.34, Radioactive Commodities in the DOD Supply System.
11. NAVSEA 9639.1, Radioluminescent Sources and Radioactively Contaminated Equipment Aboard Inactive Naval Ships and Craft.
12. NAVSUP 4510.28, Special Restrictions on Issue and Disposal of Radiological Control Materials.
13. NAVMED 6470.7, Procedures and Responsibilities for Use of Radioactive Materials at NAVMED Activities.

## **C.5 State and Local Regulations and Requirements**

An Agreement State is a state that has signed an agreement with the NRC allowing the State to regulate the use of radioactive materials—*i.e.*, specifically Atomic Energy Act materials—within that state. Table C.2 lists the Agreement States as of October 1, 1995 (see Appendix L for contacts and addresses). Each Agreement State provides regulations governing the use of radioactive materials that may relate to radiation site investigations. Table C.3 lists the states that regulate naturally occurring radioactive material (NORM) as of June 15, 1997 (PGA 1997). A number of other states are in the process of developing regulations governing the use of NORM. The decision maker should check with the state to ensure compliance with all applicable regulations.

Table C.2 Agreement States		
Alabama	Kentucky	North Carolina
Arizona	Louisiana	North Dakota
Arkansas	Maine	Oregon
California	Maryland	Rhode Island
Colorado	Mississippi	South Carolina
Florida	Nebraska	Tennessee
Georgia	Nevada	Texas
Illinois	New Hampshire	Utah
Iowa	New Mexico	Washington
Kansas	New York	

Table C.3 States That Regulate Diffuse NORM		
Arkansas	Mississippi	Oklahoma (proposed)
Colorado (proposed)	New Jersey	Oregon
Georgia	New Mexico	South Carolina
Louisiana (proposed)	North Dakota	Texas
Michigan (proposed)	Ohio	Utah